

Remarks

Reconsideration of this Application is respectfully requested.

Claims 3, 4, 6, 7, 9, 10, 12, 13, 16-18, 20-32, 35-65, and 67-70 are pending in the application, with 6, 13, 18, 38 and 60 being the independent claims. Claims 1, 2, 5, 8, 11, 14, 15, 19, 33, 34, and 66 were previously canceled. Claims 18, 20-32, and 35-37 were previously withdrawn. Claims 3, 4, 6, 7, 9, 10, 12, 38-51, 60-65, 67, and 68 are newly withdrawn. Claims 69 and 70 are sought to be added. No new matter has been introduced.

Based on the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Objections to the Drawings

Paragraph 5 of the Office Action states that the drawings were objected to under 37 C.F.R. 1.83(a). Paragraph 5 further states "the 'substrate having a plurality of contact pads on a first surface electrically connected through said substrate to a plurality of solder ball pads on a second surface of said substrate' must be shown or the feature(s) canceled from the claim(s) (See Claims 6, 13 and 38)." Applicants assert that contact pads and solder ball pads were shown in the originally filed drawings, including FIGS. 5-10. However, Applicants have modified Figures 5, 7, 9, and 10 to include examples further showing the claimed features mentioned above, as shown in the concurrently attached three replacement sheets. Example support for these drawing changes is provided in the specification on page 9, which states:

As described above, the BGA package substrate provides vias and routing on one or more layers to connect contact pads for wire bonds on its upper surface to solder balls attached to the bottom substrate surface.

Three annotated sheets are also attached, highlighting the modifications in red. For example, FIGS. 5 and 7 each are modified to show examples of routing and vias for substrate 104. An originally present contact point 120 (e.g., contact pad) for wire bond 108 is shown electrically connected through substrate 104 by vias and routing to a solder ball 106 on the bottom of substrate 104, which is attached to a solder ball pad on the bottom of substrate 104. Original FIGS. 6 and 8 each show a plurality of example contact points 120 on the top surface of substrate 104. FIGS. 9 and 10 each are modified to show additional examples of vias for substrate 104. Furthermore, FIGS. 9 and 10, as originally filed, each show conductive pads (e.g., contact pads) (labeled as conductive pads 904 in FIG. 9) that are electrically connected by routing (not shown) and vias to solder ball pads of solder balls 106.

Thus, Applicants respectfully request that the Examiner reconsider and withdraw this objection.

Objections to the Claims

In paragraph 6 of the Office Action, claim 59 was objected to under 37 CFR 1.75(c). Applicants assert that claim 59 is of proper dependent form and does further limit the subject matter of a previous claim. Claim 58 recites that said conductive material filling said via *thermally* couples said conductive bump to said heat spreader. Claim 59 recites that said conductive material filling said via *electrically* couples said conductive bump to said heat spreader. The term "thermally couples" is not necessarily

the same as "electrically couples". Therefore, Applicants respectfully request that the Examiner reconsider and withdraw this objection.

Rejections under 35 U.S.C. § 103

In paragraph 8 of the Office Action, claims 13, 16, 17, and 52-59 were rejected as being unpatentable over U.S. Patent No. 5,744,863 to Culnane et al. (hereinafter Culnane) in view of U.S. Patent No. 6,545,351 to Jamieson et al. (hereinafter Jamieson). Applicants respectfully traverse this rejection.

Independent claim 13 recites:

A ball grid array (BGA) package, comprising:
a substrate having a plurality of contact pads on a first surface electrically connected through said substrate to a plurality of solder ball pads on a second surface of said substrate;
an integrated circuit (IC) die that is mounted to said first surface of said substrate;
a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate; and
a ring shaped stiffener being centrally open in a first surface and a second surface, wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate;
wherein said second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB);
wherein said IC die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to a conductive pad on said first surface of said substrate.

Applicants assert that a *prima facie* case of obviousness has not been established in the Office Action for at least the reason that the cited art does not include a suggestion of the desirability of the combination of Culnane and Jamieson. *See* M.P.E.P. § 2143.01. For example, the proposed combination renders Culnane unsatisfactory for its intended purpose.

In Culnane, the substrate 256 includes copper pads 254 and 260. The space between copper pads 254 and 260 allows routing to connect copper pads 254 to copper pads 260. The package 10 in Jamieson includes an exposed conductive layer 26 *directly* attached to the integrated circuit 12 and to the heat slug 30. (Jamieson, col. 2, lines 29-43) In the combination of Culnane and Jamieson, the inclusion of the exposed conductive layer 26 between the integrated circuit 12 and the heat slug 30, as shown in Jamieson, precludes routing between copper pads 254 and 260 of Culnane. If copper pads 254 and 260 are not connected, then signals at pads 254 cannot be provided to the substrate 280, for example. Thus, the TBGA module 250 of Culnane would not operate, and would be unsatisfactory for its intended purpose. For at least the reason that the proposed combination would render Culnane unsatisfactory for its intended purpose, a suggestion or motivation to make the proposed combination is not present. *See* M.P.E.P. § 2143.01; *See also In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed Cir. 1984).

Therefore, for at least the reasons set forth above, reconsideration and withdrawal of the rejection of claim 13 is respectfully requested.

Claims 16, 17, and 52-59 also distinguish over Culnane and Jamieson for reasons similar to those set forth above with respect to independent claim 13, and further in view of their own features. Thus, Applicants respectfully request that the rejection of claims 13, 16, 17, and 52-59 be reconsidered and withdrawn.

Double Patenting

Paragraphs 9-13 of the Office Action state that claims 13, 16, 17, and 52-59 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Patent Application No. 09/997,272, over claims 1 and 11-13 of U.S. Application No. 09/984,259, over claims 1-33 and 57 of U.S.

Patent Application No. 09/742,366, and over claims 1-17, 35, and 36 of U.S. Patent Application No. 09/783,034.

Applicants respectfully request that these rejections continue to be held in abeyance until allowable subject matter is indicated.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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Amendments to the Drawings

Figures 5, 7, 9, and 10 have been amended. Replacement sheets and annotated sheets showing corrections in red are attached.

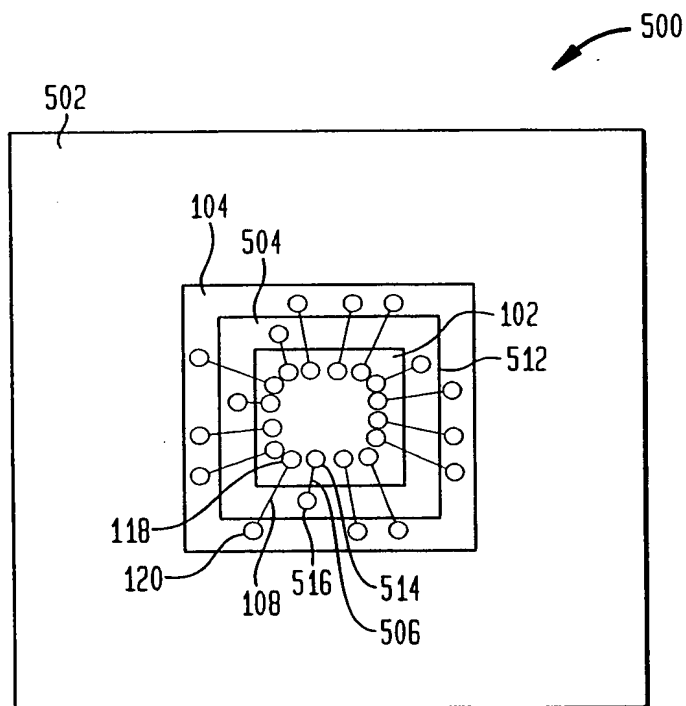


FIG. 7

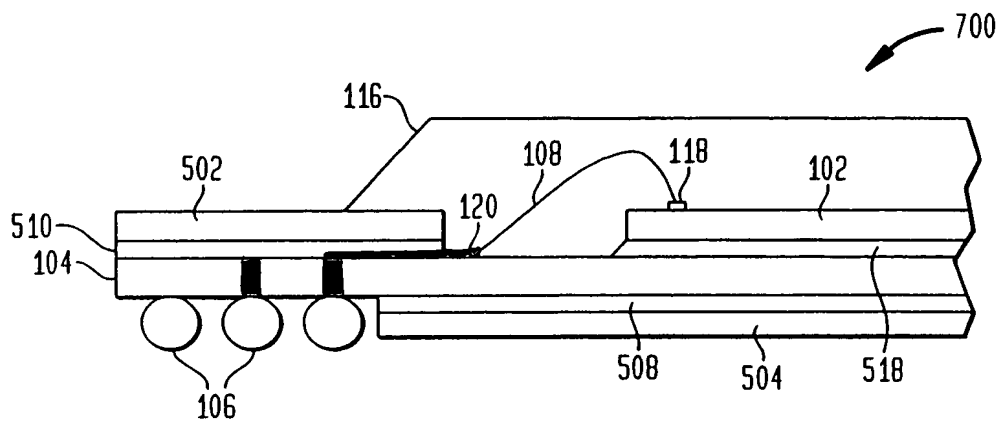


FIG. 8

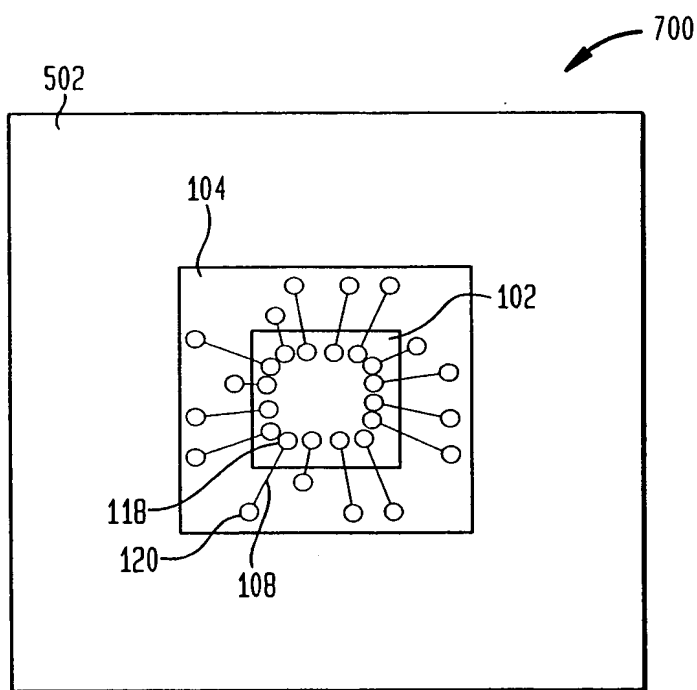


FIG. 9

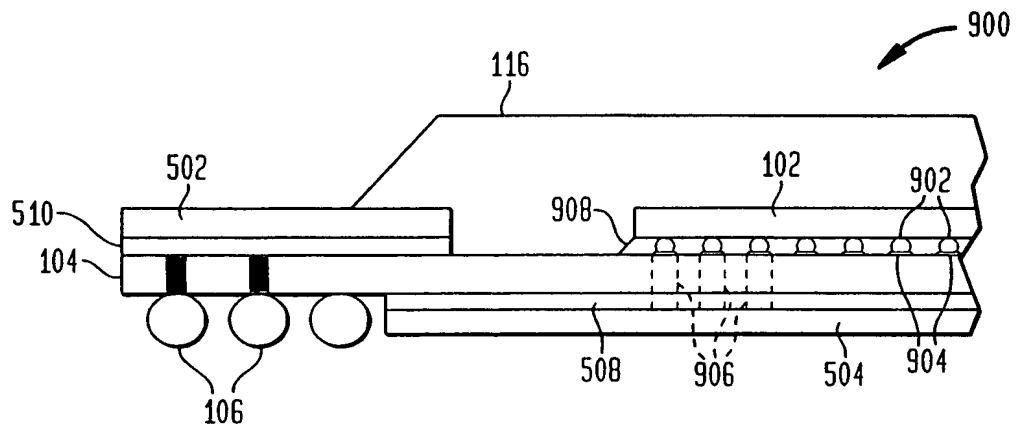


FIG. 10

